21102810

QP CODE: 21102810

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) EXAMINATIONS, OCTOBER 2021

Fourth Semester

Complementary Course - MM4CMT01 - MATHEMATICS - FOURIER SERIES, LAPLACE TRANSFORM AND COMPLEX ANALYSIS

(Common for B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry, B.Sc Chemistry Model III Petrochemicals, B.Sc Electronics and Computer Maintenance Model III, B.Sc Food Science & Quality Control Model III, B.Sc Geology and Water Management Model III, B.Sc Geology Model I, B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2019 Admission only

B4F7C707

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define Fourier Cosine Series.
2. Write the general form of fourier series expansion of a function $f(x)$ with period $2L$
3. Find $\mathscr{L}(1)$
4. State the linearlity property of Laplace transform.
5. Can we solve all types of differential equations using Laplace Transforms? If not, specify the types.
6. Find the real and imaginary parts of $z_1 z_2$ where $z_1 = 8 - 3i$ and $z_2 = 9 + 2i$.
7. Find $\frac{1}{i^5}$.
8. Evaluate $(cos\frac{2\pi}{9} + isin\frac{2\pi}{9})^9$.
9. Define a harmonic function.
10. Find the parametric representation z = z(t) of the line segment with end points z =0 and z =1+2i.
11. What is ML- inequality?

12. State Morera's Theorem.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Solve $y'' = y'$ using power series method.
14. Define Legendre polynomials. How is it different from Legendre functions?
15. Evaluate $\mathscr{L}^{-1}\left(\frac{4s+1}{s^2-16}\right)$
16. Evaluate $\mathscr{L}\{t^n e^{at}\}$ by differentiation of $\mathscr{L}\{e^{at}\}$
17. Check the analyticity of the function $f(z) = e^x(cosy + isiny)$.
18. Prove that $|sinz|^2 = sin^2x + sinh^2y$.
19. Find the real and imaginary parts of $cosh(-3 - 6i)$.
20. Evaluate $\oint_C \frac{z^2-1}{z^2+1}dz$ using Cauchy's integral formula, C is the circle |z - i| = 1.
21. Evaluate $\oint_C \frac{z^2}{(z-i)^2}dz$,C is the circle |z| = 2.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. (a.) Find the fourier series expansion of $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ $f(x + 2\pi) = f(x)$ and deduce the value of $\frac{\pi^2}{8}$?

23. Evaluate (a) $\mathscr{L}^{-1}\left\{\frac{s-a}{s(s+a)}\right\}$ (b) $\mathscr{L}^{-1}\left\{\frac{s+1}{s^2(s^2+1)}\right\}$ (c) $\mathscr{L}^{-1}\left\{\frac{s-2}{s^2(s^2+4)}\right\}$
24. Find and plot all the 8^{th} roots of unity.
25. Show that $\oint_C \frac{1}{z}dz = 2\pi i$ where C is the unit circle with centre origin. Does this contradict Cauchy's integral theorem? Justify your answer.

(2×15=30)